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Effectiveness of pre-sterilization cleaning of endodontic instruments before placement in glass bead sterilizer

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A R T I C L E I N F O

Keywords:
Manual brushing, hydrogen peroxide, Sterilization

A B S T R A C T

Background: Sterilization prevents the spread of infectious diseases. The present study was conducted to assess effectiveness of pre-sterilization cleaning of endodontic instruments before placement in glass bead sterilizer.

Materials & Methods: The present study was conducted on 40 K files contaminated by preparing canals of extracted human mandibular teeth & were divided in 4 groups of 10 instruments as group I was negative control (non contaminated), group II was positive control (contaminated without any cleaning protocol), group III was manual brushing + 3% H2O2 for 10 minutes and group IV was manual brushing + ultrasonic bath for 5 minutes. Debris score was assessed in all groups.

Results: Score 4 was seen maximally in group II and group I, score 3 in group III and group II, score 2 in group IV, III and II and score 1 in group IV, I, III and group II. The difference was significant (P< 0.05).

Conclusion: Authors found that manual brushing and ultrasonic bath is effective way of cleaning instruments as compared to manual brushing and hydrogen peroxide method.

INTRODUCTION

Endodontic instruments are often contaminated with necrotic & vital tissue, bacteria, dentin chips, blood by-products & other potential irritants which may act as antigens & precipitate spread of infection from one patient to another. This bio burden by forming a protective layer may insulate underlying micro-organisms & thus interferes with sterilization.[1]

Microorganisms are the main causative agents for endodontic diseases; hence prevention for transmission of infectious diseases among patients, dentists & its auxiliary staff through proper disinfection & sterilization is of utmost importance.[2]

Microorganisms induce a variety of infectious diseases in the human body. Infection control is a major topic of concern in medical and dental health care settings. Contamination directly or indirectly leads to transmission of infectious agents. The prevention of cross-contamination of infectious diseases among dental staff and patients is a major problem which dental practitioners face. Sterilization prevents the spread of infectious diseases.[3] In dentistry, it primarily relates to processing reusable instruments to prevent cross-infection. In endodontic, various instruments like files, reamers, gates glidden drill and peeso reamers are used for cleaning and shaping the root canal and to eliminate the bacterial population in pulp canal space. There are various methods to sterilize these instruments, such as dry heat sterilizer, autoclave, ethylene oxide gas, glass-bead sterilizer or hot-salt sterilizer, etc.[4] The present

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study was conducted to assess effectiveness of pre-sterilization cleaning of endodontic instruments before placement in glass bead sterilizer.

MATERIALS & METHODS

The present study was conducted in the department of Conservative dentistry. It comprised of 40 K files contaminated by preparing canals of extracted human mandibular teeth & were divided in 4 groups of 10 instruments as group I was negative control (non contaminated), group II was positive control (contaminated without any cleaning protocol), group III was manual brushing + 3% H2O2 for 10 minutes and group IV was manual brushing + ultrasonic bath for 5 minutes. The study was approved from institutional ethical committee. All patients were informed regarding the study and written consent was obtained.

Data such as name, age, gender etc was recorded. After air drying all the instruments were immersed in Van-Gieson's stain for 3 minutes. They were then rinsed under running distilled water and again air dried. The instruments were then examined for debris at 3 levels apical, middle & coronal using a stereomicroscope.

Scoring system was used as 0- clean surface without any debris, 1- organic film, 2- slight staining in the form of single particles of debris scattered on the instrument surface, 3- moderate staining, organic particles covering the surface of the instrument as a continuous layer and 4- a high level of staining, with the cutting flutes completely covered with debris. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I: Distribution of patients

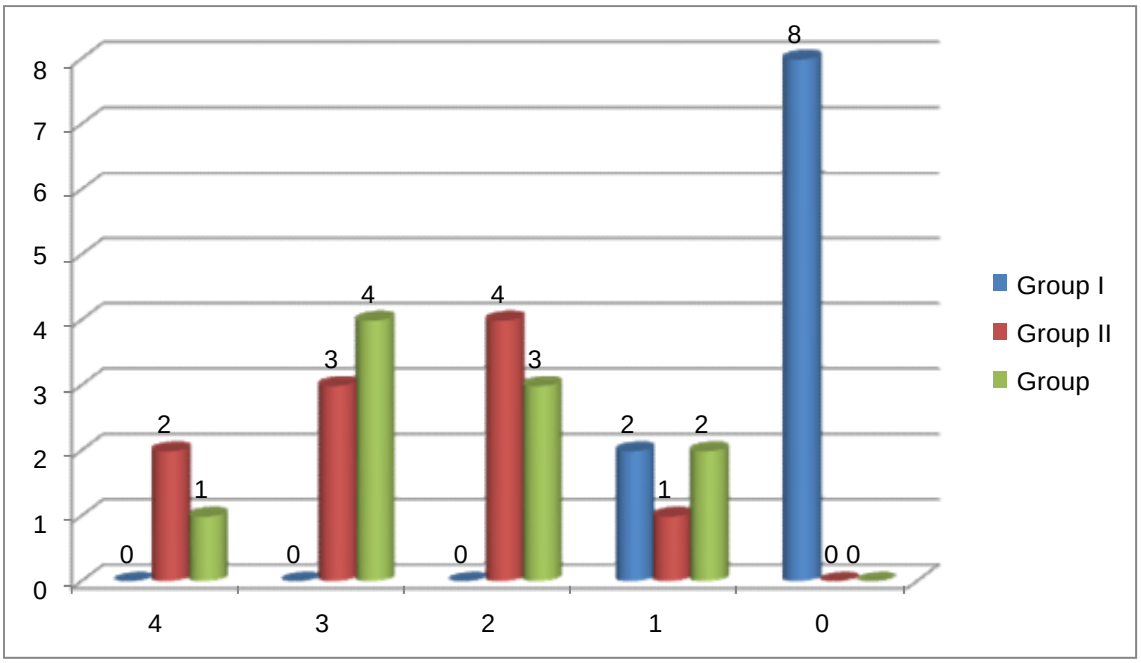
Groups	**Group I**	**Group II**	**Group III**	**Group IV**
Agent	Negative control	Positive control	Manual brushing + 3% H2O2	Manual brushing + ultrasonic bath
Number	10	10	10	10

Table I shows distribution of teeth based on cleaning procedure used in the study.

Table II: Assessment of debris score

Score	**Group I**	**Group II**	**Group III**	**Group IV**	**P value**
4	0	2	1	0	0.02
3	0	3	4	0	
2	0	4	3	5	
1	2	1	2	5	
0	8	0	0	0	

Table II, graph I shows that score 4 was seen maximally in group II and group I, score 3 in group III and group II, score 2 in group IV, III and II and score 1 in group IV, I, III and group II. The difference was significant (P< 0.05).



Graph I: Assessment of debris score

DISCUSSION

Endodontic instruments are often reused repeatedly during root canal preparation. This possesses great risk of contamination & transmission of infection if cleaning and sterilization protocol is not strictly followed. Cleansing, disinfection and sterilization are well known requirements in dentistry to avoid chain of contamination.[5] Sterilization of instruments is done by three major methods: Steam under pressure (autoclave), dry heat and chemiclave. Lasers have also started being used as a method for sterilization. The bacillus stearothermophillus contaminated endodontic k-files in this study are heat-resistant bacteria spores. Various modes have been adopted for sterilizing endodontic instruments but out of them Steam autoclaving and glass-bead sterilizers are commonly recommended.[6] The present study was conducted to assess effectiveness of pre-sterilization cleaning of endodontic instruments before placement in glass bead sterilizer.

In present study, 40 K files contaminated by preparing canals of extracted human mandibular teeth & were divided in 4 groups of 10 instruments as group I was negative control (non contaminated), group II was positive control (contaminated without any cleaning protocol), group III was manual brushing + 3% H2O2 for 10 minutes and group IV was manual brushing + ultrasonic bath for 5 minutes.

Glass bead sterilizer, which works under the principle of dry heat, is the rapid chair side sterilization technique and is the most commonly used method of sterilization of endodontic files. The beads used should be smaller than 1 mm in diameter because large beads are not effective in transferring heat to the instruments. Moreover, the presence of large air spaces between the beads prevents heat transfer.[7]

The most commonly used agent for cold sterilization is glutaraldehyde. It has a broad spectrum of biocidal activity with pungent odor. It penetrates into blood and

exudates due to its low surface tension and permits rinsing. However, contact with glutaraldehyde liquid as well as vapor severely irritates the eyes and burns the skin. Hence, the need for safer chair side cold sterilization method is looked on as an alternative.[8] Ramakrishna et al[9] conducted a study in which 50 K files (15 No.) were contaminated by preparing canals of extracted human mandibular teeth. Instruments were divided in five groups of 10 instruments each and different cleaning protocols were applied to each group. The selected endodontic instruments were then immersed in Van-Gieson's stain and debris was evaluated under stereomicroscope for scoring. 81% of the selected samples showed residual debris. Combination of mechanical and chemical (2% glutaraldehyde) cleaning procedure followed by ultrasonic bath was found to be an effective method of removing debris from endodontic instruments. There was a statistically significant difference in the mean values with respect to the various cleaning protocol applied.

We found that score 4 was seen maximally in group II and group I, score 3 in group III and group II, score 2 in group IV, III and II and score 1 in group IV, I, III and group II. Popovic et al[10] investigated the effects of a sponge soaked in alcohol and an ultrasonic bath. They found that none of these methods were able to clean the instruments totally and effectively. These manual techniques required considerable amount of time and had risk of reintroducing contamination as were carried out by the human factor.

CONCLUSION

Authors found that manual brushing and ultrasonic bath is effective way of cleaning instruments as compared to manual brushing and hydrogen peroxide method.

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